# Innovation

## Key to Strengthening U.S. Competitiveness

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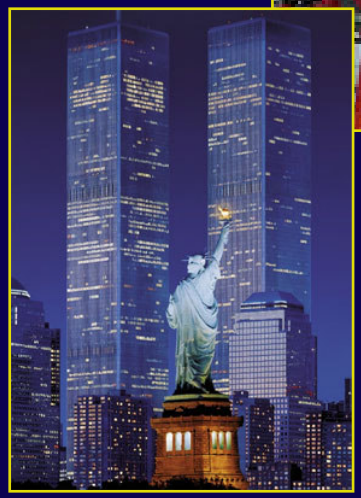
# Innovation

## Key to strengthening U.S. competitiveness

- Powerful forces reshaping the global economy
- Building an economy based on innovation
- The National Innovation Initiative
- Implementing the NII recommendations

# Societal forces



- Growing population
- Fresh water shortages
- Global warming, environmental problems
- New diseases
- Terrorism; wars in Iraq, Afghanistan

# Economic forces

- Internet/high-speed communications
- Markets have opened up
- Emergence of technology-based economies in other nations
- Sustained investment in higher education in countries like China and India

# Changing profile of businesses

- Rapid commercialization of new technology brings R&D closer to manufacturing.
- Yesterday's multi-national companies have become today's global companies:
  - Partnerships with companies around the world.
  - Products that recognize cultural nuances.
  - International identities.
- Global companies generate 80 percent of the world's industrial production, but only a fraction are manufacturers.  Many provide services.

# Context for product development

- Social, cultural, political forces will shape and affect the success of technological innovation.
- Consumers are more diverse.
- Consumers will demand higher quality, customization.
- Growing imperative for environmental sustainability.
- Increasing focus on managing risk and assessment with view to security, privacy, and safety.

# The United States must learn to compete in a world in which…

- The largest technological workforces reside in other nations.
- We generate only one of four or five major inventions.
- Our wages and health care costs are higher than our global competitors.
- The domestic market we offer is very small in size compared to Asia.

# Are we prepared to do that?

"The U.S. is not graduating the volume of scientists and engineers, we do not have a lock on the infrastructure, we do not have a lock on the new ideas, and we are either flat-lining or, in real dollars, cutting back our investments in physical science and engineering. The only crisis the U.S. thinks it has today is the war on terrorism. It's not."

Craig Barrett
Chairman, Intel

"The National Innovation Initiative defines innovation as the intersection of invention and insight, leading to the creation of social and economic value."

*InnovateAmerica*
NII report, December 2004

Innovation puts the discoveries and inventions of science and technology to work to solve problems, address society's needs, meet market demands, and even create new markets. It is a social activity that emerges from interdisciplinary conversation and collaboration.

# Purpose of the NII

- Brought together 400 of America's top minds on innovation.
- Sharpened our understanding of how the innovation process is changing and how it can be harnessed for economic growth.
- Advocated a strategic action agenda to create a fertile environment for innovation that respects the right and values the participation of other nations in this space.

# Context for innovation

- The bar for innovation is rising:
  - Multi-disciplinary and complex
  - Diffusing at an increasingly rapid rate
  - Collaboration between creators and users
  - Global in scope
- Appropriate balances are more critical:
  - Between competition and collaboration
  - Between security and openness
  - Between national interests and globality
  - Between analysis and ambiguity

# Characteristics of an innovation leader

- Large corps of scientists and engineers
- Flexible and skilled workforce
- Strong investment in R&D
- Reliable utilities and infrastructure
- Policies that support and value innovation
- Competitive tax and investment climate
- Trade agreements and IP protection that provide a level international playing field

# The resources for innovation

- Talent, the human dimension

- Investment, the financial dimension

- Infrastructure, the physical/policy dimension

"We came to India for the costs, we stayed for the quality, and now we're investing for the innovation."

Dan Scheinman, Senior VP, Cisco

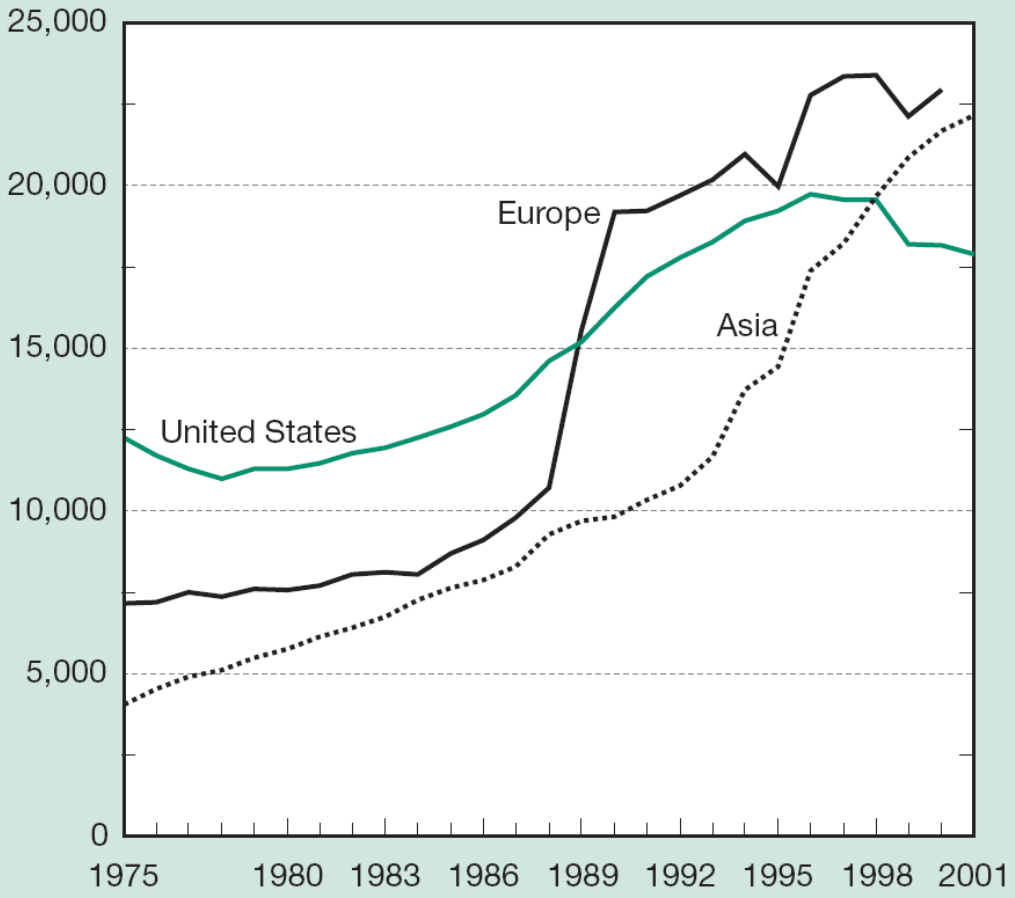
# Human capital concerns

- China will graduate 600,000 engineers this year, India 350,000, the United States 70,000.*
- Visa restrictions stifle flow of international students to U.S.
- Women, minorities are under-represented in science and engineering.
- Creative disruption increasingly displaces workers, requiring career changes.

* *Fortune*, July 25, 2005

# U.S. doctoral degrees decline

**NS&E doctoral degrees in United States, Europe, and Asia: 1975–2001**



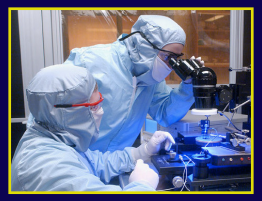

NS&E natural sciences and engineering

International students, who once received as many as half of the engineering doctoral degrees awarded in the United States, increasingly pursue their studies at home.

NSF Science & Engineering Indicators 2004

# **Talent**: NII Recommendations

- Build the base of scientists and engineers:
  - Graduate fellowship programs
  - Attract best talent from around the world
- Catalyze the next generation of innovators:
  - Internships for students with start-up companies and small businesses
- Empower workers to succeed in the global economy:
  - Lifelong learning opportunities
  - Health benefit and pension portability



# Research portfolio needs work

- Overall federal research funding declined from 2% of the GDP in the mid-1960s to less than 1% today.
- Research funding for the physical sciences and engineering has lagged compared to funding for the life sciences.
- Budget deficits, wars in Iraq and Afghanistan have strained resources, requiring higher level of coordination among government, industry and higher education.

# Refocusing capital investment

- Venture capital concentrated in regional pockets; not widely distributed.
- Need for more innovation “hot spots” based on regional economic clusters.
- Markets emphasize short-term returns, low risk; innovation requires long view, risk tolerance.

# **Investment**: NII recommendations

- Revitalize and balance research investment.
- Energize the entrepreneurial economy:
  - Coordinate economic development policies to promote innovation.
  - Build regional “hot spots.”
- Reinforce risk-taking and long-term investment in the financial markets.

# Infrastructure falls behind

- The U.S. has fallen to 13th place in the global rankings for broadband Internet usage and is the only industrialized nation without an explicit national policy to promote broadband access.*
- The patents process needs to be modernized for speed, searchability, and greater focus on quality.
- Nationwide systems such as health care suffer from high cost, low productivity, limited coverage.

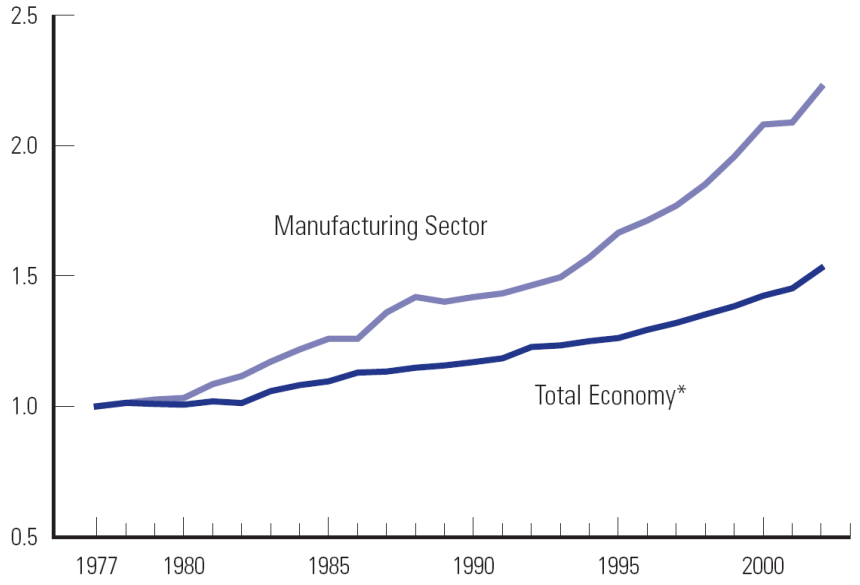
* *Foreign Affairs*, May 2005

# Helping manufacturing compete

- New manufacturing technologies brought more rapidly into the production cycle.
- Shifts in manufacturing model:
  - From mass production toward customization
  - From centralized to distributed production
  - From centralized control to collaborative relationships between distributed sites
- Manufacturers who are innovating have higher growth, profitability, and productivity rates.

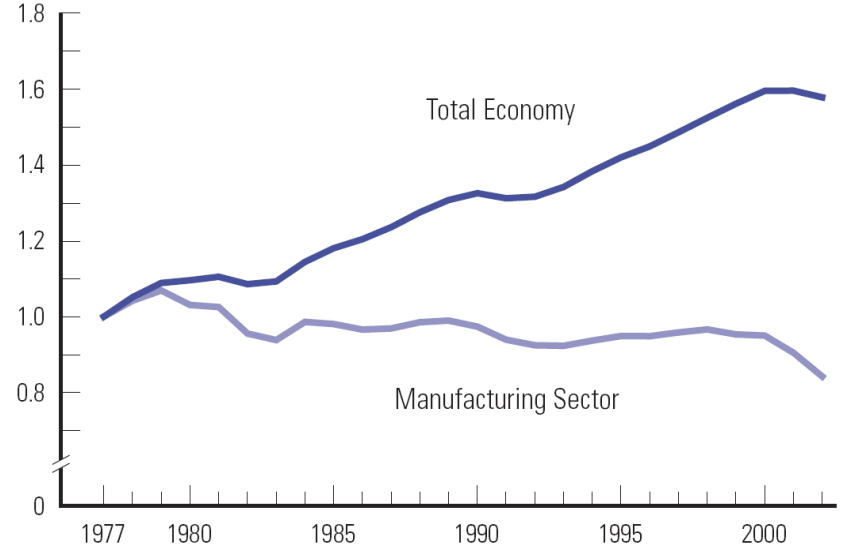
# Improving productivity shrinks the manufacturing workforce

## U.S. Productivity (1977-2002)




* Excludes government and agricultural sectors.
**Index:** 1977 = 1.0
**Source:** U.S. Department of Labor, Bureau of Labor Statistics.

## U.S. Employment Growth (1977-2002)




**Index:** 1977 = 1.0
**Source:** U.S. Department of Labor, Bureau of Labor Statistics.

NOTE: Manufacturing's contribution to real private output growth has remained roughly the same since 1977.

# Innovation metrics

- Markets focus on 20th century measures of value (land, facilities, equipment, etc.) but innovation relies on intangible human and intellectual assets.
- 2003 Accenture global CEO survey:
  - 49% believe intangible assets are the primary source of wealth creation for their company.
  - 5% have metrics to measure intangible assets.

# **Infrastructure**: NII recommendations

- Bring intellectual property policies and the patenting process into the 21st century.
- Strengthen U.S. manufacturing capacity.
- Develop new metrics to measure and manage innovation.
- Address national systems like health care.
- Create best practices/awards programs to recognize and promote innovation.

# Implementing NII recommendations

- Engaging Congress:
  - Omnibus legislation to address recommendations sponsored by Senators Lieberman and Ensign
  - Meetings with Senators and Representatives
  - Innovation Day on Capitol Hill July 20
- Engaging the federal government:
  - Department of Labor
  - Department of Commerce
  - Department of Energy
  - National Science Foundation

# Implementing NII recommendations

- Engaging communities:
  - National Summit on Regional Innovation
  - Regional summits upcoming, beginning in October in Atlanta
- Global innovation
  - European Union summit, The Hague
  - Japan

"The big winners in the increasingly fierce global competition for supremacy will not be those who simply make commodities faster and cheaper than the competition. They will be those who develop talent, techniques, and tools so advanced that there is no competition."

*Ensuring Manufacturing Strength through Bold Vision*
National Science Foundation report

# Dr. G. Wayne Clough

- President, Georgia Institute of Technology
- Vice-chair, U.S. Council on Competitiveness
  - Co-chair of the National Innovation Initiative
- Member, National Science Board
- Member, President's Council of Advisors on Science and Technology
- Chair, Engineer of 2020 Initiative, National Academy of Engineering